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Modern Reinforcement Methods for Brick Building Repair

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Abstract: The article examines the causes of defects and damage identified as a result of research of brick buildings, as well as modern methods of their reinforcement. The disadvantages of traditional reinforcement methods and the advantages of reinforcement with carbon fiber composite material are also highlighted.

Keywords: *defect, damage, crack, reinforcement, metal, composite material*

Introduction. Brick is widely used in construction because it is a local, natural, environmentally friendly and heat-and-cold-resistant material. Even our ancestors built historical monuments from it, which have attracted the whole world to this day. Today, in our country, as well as in Samarkand, about 40% of the buildings built to date are brick buildings. Many of the brick buildings and structures since the 1950s have suffered damage as a result of various impacts. These damages were caused by disruption of technological processes during construction and work performed in winter, uneven deformation of load-bearing walls, internal and external impacts on buildings, improper organization of operation and untimely maintenance and repair of buildings. Failure to carry out repairs in a timely manner, as a result of irresponsible attitude of people to the operation of the building, will lead to a sharp increase in damage and a reduction in the normal service life of the building. Failure to take this process in a timely manner will cause the buildings to fall into disrepair over time.

Methodology. Any building and structure operates under various influences during its service life. Over time, these effects also have a negative impact on building and construction structures. Under these influences, uneven subsidence, deformation, brick crumbling, cracks, moisture conditions are observed in the building. If the damage is not treated in time, the building will be in an emergency situation. Buildings and structures must be constantly monitored to prevent this from happening. That is, the technical operation of the building must be properly established.

Taking into account the operating conditions of buildings and structures, the timing of current and overhaul works should be carried out in the manner specified in the SNC [6]. If we carry out repairs in the buildings on time, the buildings in which we live will have a five-year service life.

Results and observations. As a result of the authors' research of brick buildings in Samarkand and Navoi, the following defects and damages were identified:

- Poor quality of construction work;
- Arbitrary changes to the building's spatial planning solution by users;

- Absence or improper execution of otmoska around the building;
- water accumulation in the basement due to a malfunction of the communication system;
- cracks in the walls as a result of uneven subsidence of the building, see Figure 1;
- humidity in the basement of the building due to poor quality of horizontal and vertical waterproofing, see Figure 2;
- moisture in the top floor walls and roof covering due to failure of the roof waterproofing layer, see Figure 3;
- damage to the brick and mix under the influence of temperature due to moisture in the wall, see Figure 4;
- The thickness of the seams in the brickwork exceeds the requirements of the QMQ.

The results of research on real facilities have shown that technical operation is not properly established in all buildings and structures. The main reasons for this are that the users of the building do not understand the operational requirements or ignore them even if they do understand Figures 1 - 4.

The above-mentioned shortcomings and damages have a negative impact not only on the durability of buildings but also on the energy efficiency of these buildings. At a time when there is a shortage of energy around the world, it will also affect the economy of our country. We know that heat loss in a building is 28% of the dry exterior wall and 17% of the roof covering. Moisture in the walls of the building, cracks, moisture in the attic and roofing dramatically increases the thermal and cold conductivity of structures, as well as leads to high energy consumption.

Picture 1. Cracks in the walls as a result of uneven building sinking

Picture 2. Moistness of the building's foundation and basement

Picture 3. Moistness of the reinforced concrete slab and walls.

Picture 4. Damages of moisturized brick and mixture under the influence of temperature

That is why we must prevent the appearance of cracks and moisture in the external barrier structures, roofing. If they do occur, we need to develop ways to eliminate them.

Wire nets and metal profiles are widely used in the strengthening of brick buildings in the country, mainly by traditional methods. In addition to strengthening the building, it will have to cause additional damage to the building. During the fastening of the metal structure to the building, the opening of holes in the walls causes additional damage to the building and reduces the strength of the building, which has an impact on the energy efficiency of the building due to incomplete closure

of openings [5].

Figure 5. Reinforcement of brick building using metal profiles.

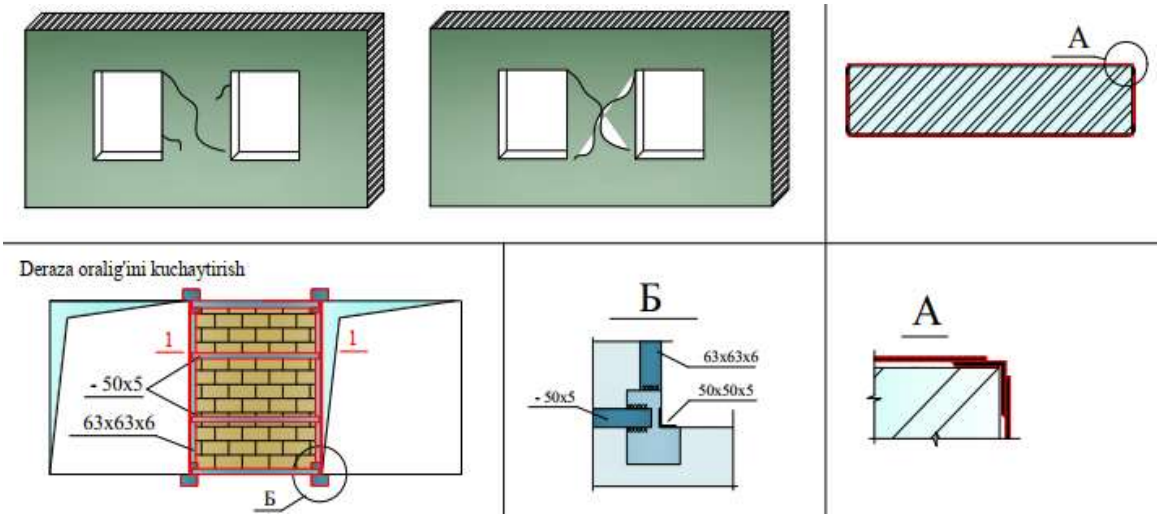

Figure 6. Damage between two windows and a way to strengthen it.

Research by our scientists shows that according to Faraday's law, a current of 1A absorbs 9.12 kg of iron in 1 year when it affects the structure. From this it can be concluded that stray currents are extremely dangerous for metal construction. The factors mentioned above gradually reduce the reliability of the metal structure. Under the influence of the above and various other factors, significant changes occur in the structural elements, resulting in a violation of the distribution of internal forces, which in turn has a negative impact on the safety of human life.

Another important point is that the use of metal structures in the process of strengthening brick buildings requires a lot of heavy labor, the involvement of machinery and the high cost of metal, which leads to several increases in the cost of reinforcement [4].

If cracks appear in the load-bearing walls of the building, it is advisable to reinforce the walls of the building with carbon fiber composite materials to ensure reliable operation under the influence of loads.

Today, the use of modern materials in the construction industry, the use of innovative technologies is developing significantly.

The use of materials resistant to static and dynamic loads and resistant to aggressive environmental conditions is also a topical issue in the strengthening of buildings. Therefore, in the prevention of damage to buildings, it is important to strengthen buildings, increase energy efficiency and increase the service life of the building, to carry out reinforcement work in a convenient, fast and cost-effective manner.

Carbon fiber composite material is used in construction in various external reinforcement systems - with its help reinforced concrete, metal, brick and wood structural elements of buildings and structures can withstand long-term natural influences, aggressive environments and seismic forces during operation and corrosion of reinforcement. used to prevent. The essence of this method is to increase the strength of the load-bearing elements during the operation of buildings and structures using carbon fabrics, tapes and nets.

Reinforcement of building structures with carbon fiber composite material increases the load-bearing capacity of the facility without changing the structural scheme.

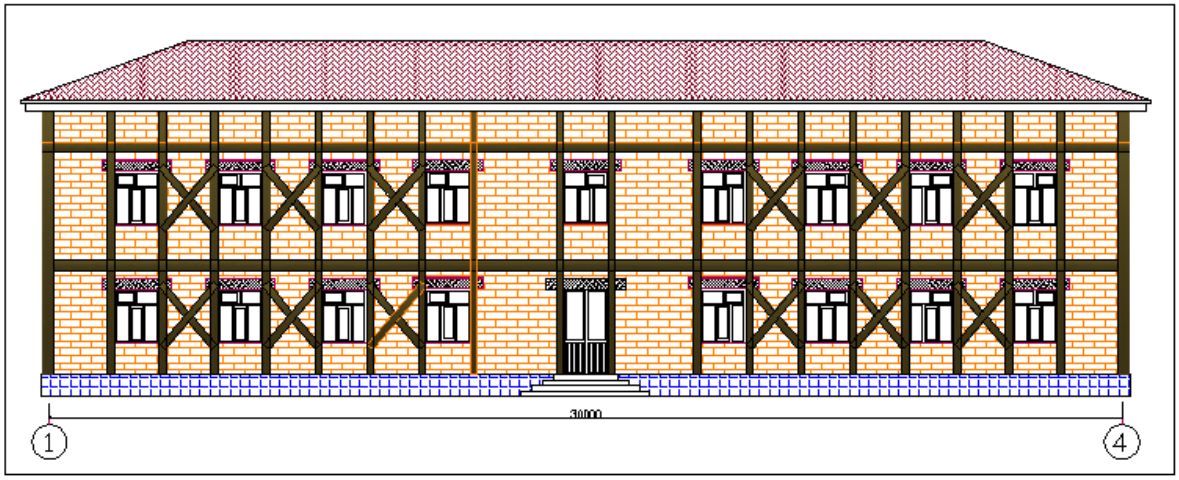

Figure 7. Reinforcement of brick building using composite material

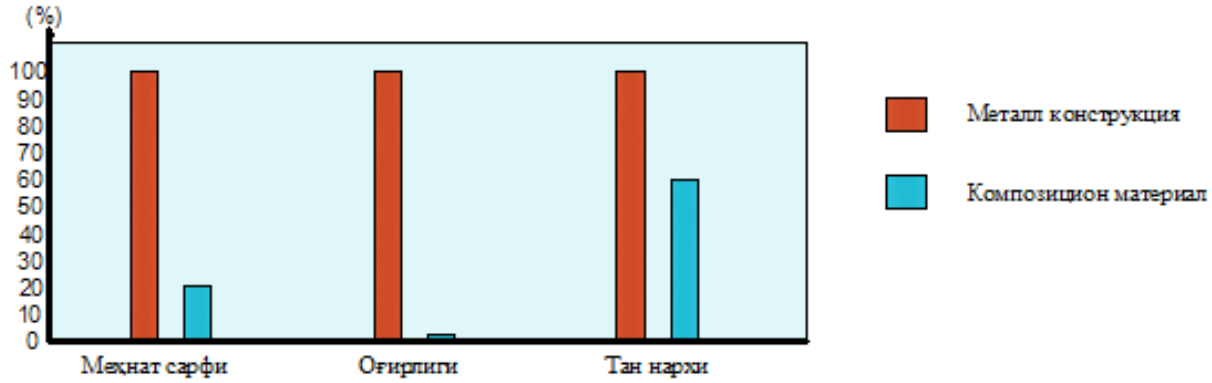

Figure 8. Costs for metal construction and composite material.

The convenience and efficiency of this method is that this composite material is in the form of tape, much lighter than metal, but 4-5 times stronger than metal, heat-resistant, low labor cost, less labor-intensive than metal in terms of reinforcement work [2].

Conclusions and suggestions.

If we carry out timely inspections of buildings and structures, eliminate the identified defects and damages and operate them correctly and wisely, our buildings will serve for many years as monuments of our ancestors.

Entrusting the construction and repair of buildings and structures to people who are experts in their field, serves to ensure the reliability of our buildings.

If we use modern carbon fiber composite materials in the reinforcement of brick buildings and structures, the cost of repairs will be saved several times.

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